and ecological, under the several families, the helpfulness of which is much increased by the profusion of admirable illustrations, by numerous bibliographical references, and by a very full index.

PHYSICAL TEXT-BOOKS.

(1) *Grundrisz der Naturlehre für Gymnasien und Realschulen.* By E. Mach. Bearbeitet von Dr. Karl Habart. Unterstufe. Siebente Auflage. Pp. 181. (Wien: F. Tempsky, 1911.) Price 2.50 marks.

(2) *An Elementary Course on Practical Applied Electricity and Magnetism.* By D. H. Ogley. With a preface by Dr. W. G. Rhodes. Pp. xi+134. (London: Longmans, Green and Co., 1911.) Price 2*s.* 6*d.* net.

(3) *An Introductory Course of Mechanics and Physics for Technical Students.* By W. M. Hooton and A. Mathias. Pp. vii+148. (London: W. B. Clive, University Tutorial Press, Ltd., 1911.) Price 1*s.* 6*d.*

(4) *The Ontario High School Physics.* By Dr. F. W. Merchant and Prof. C. A. Chant. Pp. viii+504. (Toronto: The Copp, Clark Company, Ltd., n.d.) Price 90 cents.

(5) *The Ontario High School Laboratory Manual in Physics.* By Dr. F. W. Merchant and Prof. C. A. Chant. Pp. viii+128. (Toronto: The Copp, Clark Company, Ltd., n.d.) Price 35 cents.

(6) *Lehrbuch der Physik.* Nach Vorlesungen an der Technischen Hochschule zu München, von Prof. H. Ebert. Erster Band:—Mechanik—Wärmelehre. Pp. xx+661. (Leipzig and Berlin: B. G. Teubner, 1912.) Price 14 marks. (Naturwissenschaft und Technik in Lehre und Forschung, herausgegeben von Prof. F. Doflein und Prof. K. T. Fischer.)

(7) *An Intermediate Course of Practical Physics.* By Rajanikanta De. Pp. xii+284. (Calcutta: The International Publishing Co., 1911.)

(1) THIS little book comprises introductions to the various sections of physics, including mechanics and astronomy. The treatment is almost entirely qualitative, as is to be expected in an elementary-school book. For such purposes it appears to have many good points. The statements of the fundamental principles are clear, the printing is excellent, and the diagrams with which the various experiments are profusely illustrated are very good, particularly those bearing on the movements of the heavenly bodies. Perhaps the order in which the subjects are taken is a little peculiar, the treatment of mechanics being given towards the end of the book. This would be a serious defect in a work of wider scope, in which quantitative measurements in electricity and magnetism were described; here, however, the order of the subjects is comparatively indifferent.

(2) It is probable that most teachers of practical physics have experienced the difficulties to help to remove which this book has been produced. The difficulties arise from the small amount of individual attention which it is possible for a demonstrator to give in large practical classes. As the writer of the preface points out, this is especially so in cases where the number of hours devoted by students to practical work is very small. The method which the author adopts for lessening this undoubted defect in teaching is as follows:—Not only are instructions as to procedure in a given experiment stated, but the observations are also explained theoretically. Thus a student can prepare beforehand for the experiment assigned to him, and need not work unintelligently even in the absence of the demonstrator. This book should certainly serve the purpose for which it was written. It consists of a collection of some sixty experiments in magnetism and electricity which have been carefully and clearly treated after the manner above referred to. There are, however, no experiments in electrostatics described—an omission which somewhat reduces the value of the book. Comparatively few teachers realise that many simple yet instructive experiments in that department can be performed with very inexpensive apparatus. With regard to the standard of the work, it is pointed out that it is suitable for the elementary examination in electrical engineering of the City and Guilds of London Institute.

(3) This book is similar in many respects to the one commented upon above, and most of the remarks apply to it also. The subjects treated are mechanics and heat, and all the experiments are quite simple and can be performed with very inexpensive apparatus. Sets of examples at the ends of the various chapters are given, and a table of some physical constants is to be found at the end of the book.

(4) There appears to be a tendency in recently published text-books of physics—particularly those emanating from America—to crowd too much into too small a volume. Of such this is a typical example. It is true that it is elementary in character and scarcely touches upon the exact side of the science; nevertheless the impression of "hurry" is very markedly felt in reading it. Instead of clearly dealing with and laying stress upon the essential and fundamental points, the authors, in many places, do no more than

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create a vague impression. For example, in dealing with the question of acceleration, we find stated:—"Let a body move in a straight line, and measure its velocity. At one instant it is 200 cm. per second; 10 seconds later it is 350 cm. per second." Yet there is no indication of the mode of measurement, nor is an instantaneous velocity even defined. Further, a considerable amount of space is wasted in rather absurd diagrams of common objects to which the principles of physics apply, and in portrait drawings of various famous physicists, both of which features the authors regard as likely to stimulate the interest of students. Speaking generally, it may be said that this book contains too much detail for a popular exposition, and too little exact information for truly scientific study.

(5) Several curious features are to be found in the laboratory manual also. It is intended to accompany the theoretical treatment in the previous book, to which reference is always made in connection with the experiments. One cannot help thinking that some of the observations are purely imaginary, and not actually carried out by the students. Experiment 36, for instance, is on the measurement of the velocity of sound in air with a stop-watch and a gun. Two boys are required at about a mile apart. The one has a gun and the other a stop-watch. The usual procedure follows. If a breeze is blowing, the observers should *change positions,* and so on. An alternative, and equally absurd, method is also described. Most of the experimental work is quite simple, but the instructions are not always clear, and considerable individual help on the part of the teacher would be indispensable to the students. The printing, both in this book and the accompanying one, is very good.

(6) Prof. Ebert's book is a large volume comprising the theoretical treatment of mechanics and heat. In using the word "mechanics," however, it must be understood that the first section of the book is concerned with sound, and what is usually styled "properties of matter," even more than with mechanics in the sense of applied mathematics. Indeed, the somewhat disordered mixture of these subjects is the only serious objection to the book. It is difficult to understand, for instance, why the definitions of the absolute units of force and work are postponed to so late a stage (p. 216), especially in view of the fact that such subjects as elasticity and osmotic pressure have been considered previously.

The second part of the book is distinctly superior to the first. A more logical treatment renders it more easy to follow, the subject is considered in greater detail, and none of the important principles of thermo-dynamics nor their applications are omitted. Taken on the whole, the book is a good one, and has evidently been prepared with great care. One of the chief features is the large number of experiments which are described—in fact, the book is essentially an experimental treatise. These experiments are illustrated with carefully prepared diagrams, and numerous numerical examples form a useful addition to the text.

(7) This is yet another practical physics manual, compiled in this case for the students in Calcutta University and in use there for the intermediate course. It consists of instructions for the performance of a few simple experiments in each of the branches of physics, together with some information regarding general laboratory processes such as glass-blowing. There is little to distinguish the book from many of a similar kind. Fewer experiments, perhaps, are undertaken, one only—the resonance tube—constituting the whole section on sound. The instructions are clearly stated, but the printing and the diagrams leave much to be desired. The latter failing is, however, common to many books produced in India.

THE TESTING OF BUILDING STONES.

Handbuch der bautechnischen Gesteinsprüfung. By Prof. J. Hirschwald. Erster Band. Pp. xi +387. (Berlin: Gebrüder Borntraeger, 1911.) Price 20 marks.

IN this country, and to a great extent elsewhere, the testing of building stones has fallen short of the precision attained in the testing of other materials of construction. This has been due partly to the lack of any generally recognised standard methods, and partly to the neglect of the petrological characters peculiar to stones of different kinds.

Tests of building stones are usually made for two distinct purposes, namely, to measure their comparative resistance to mechanical stresses and to find their relative capacity of resistance to weathering.

It certain quarters it has been the practice to decry the testing of building stones on the ground that it is unnecessary, since any stone worth employing at all will be strong enough for the purpose; and as to weathering, since that may be regarded as "an act of God," it is no use troubling about it. Some, while admitting that tests may be desirable, have no faith in the methods usually employed, and suggest rather an examination of the rocks in the field and in the quarries. There is something to be said for this point of view,

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